STANDARD X QEPR

Quality Education Pupil's Right

Orukkam 2017

An Intensive Learning Material

Physics

Department of General Education , Kerala

Orukkam Activities - Guidelines

Orukkam 2017, which is an intensive learning material, is an examination aid for Standard X students. It aims at achieving best results to all students in the SSLC Examination through a systematic process. Each unit is analysed, answers explained and on the basis of these the students may undergo a process on the discourses. During the process of the activities, students may self-assess their answers and analyse them based on the process mentioned in this book. Teachers may share the problems that arise during the process and help the students to overcome such problems. The activities in this book is to be completed time bound and should help the students to inculcate the process. Heads, teachers, students and parents should come cooperate and associate on the implementation of this process and assure the best result in their schools. Hope all of you will do the best.

All heads of institutions should ensure that the programme of this learning material has started in the school from January 11, 2017.
Convene a meeting of SRG in the first week of January and plan the activities.
PTA, MPTA, SMC, meetings should be held in the school to ensure their support.
Provide food for students.
Each teacher should explain how the material can be effectively imparted in the classroom.
Programmes similar to this can be held in class 8 and 9.
Let's work together to achieve the goal of Excellence.

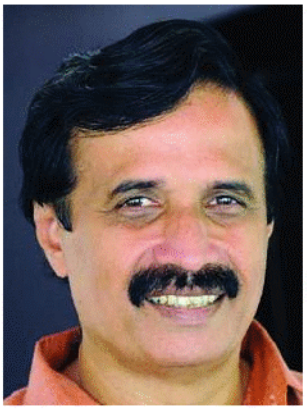
Prepared by:

V.S HARIKUMAR, H.S.A PHYSICAL SCIENCE, DVMNNM HSS MARANALLOOR, TRIVANDRUM

K. BIJU, H.S.A PHYSICAL SCIENCE, HSS KADACHIRA, KANNUR

K.VPRAKASAN, H.S.A PHYSICAL SCIENCE, MAMBARAM H.S.S., KANNUR

V.R AJITH, H.S.S PHYSICAL SCIENCE, A.KM HS KUDAVOOR, KILIMANOOR, TRIVANDRUM



PROF. C. RAVEENDRANATH
MINISTER FOR EDUCATION
GOVERNMENT OF KERALA

സന്ദേശം

കേരളത്തിലെ സ്കൂൾ വിദ്യാഭ്യാസം നേരിടുന്ന പ്രശ്നങ്ങൾ പഠിച്ച് അവ പരിഹരിക്കുന്നതിനുള്ള ക്രിയാത്മക പ്രവർത്തനങ്ങൾ നടപ്പിലാക്കുക എന്ന ലക്ഷ്യത്തോടെ 2006ൽ ആരംഭിച്ച **ഗുണമേന്മയുള്ള വിദ്യാഭ്യാസം കുട്ടികളുടെ അവകാശം** (Quality Education Pupil's Right - QEPR) എന്ന പദ്ധതി പത്തുവർഷം പൂർത്തിയാക്കുകയാണ്. സ്കൂളുകളിലെ ലാബ്, ലൈബ്രറി സൗകര്യങ്ങളുടെ മെച്ചപ്പെടുത്തൽ, പോഷകസമൃദ്ധമായ ഉച്ചഭക്ഷണം, കൃത്യമായി ആസൂത്രണം ചെയ്ത് നടപ്പിലാക്കുന്ന പഠനപ്രവർത്തനങ്ങൾ, ഫലപ്രദമായ മോണിറ്ററിംഗ് എന്നിവയിലൂടെ പിന്നോക്കം നിന്നിരുന്ന വിദ്യാലയങ്ങൾ ശ്രദ്ധേയമായ പുരോഗതി കൈവരിച്ചു കഴിഞ്ഞു. കൂട്ടായ പരിശ്രമങ്ങളിലൂടെ ലഭിച്ച നേട്ടങ്ങളെ സ്ഥായിയായി നിലനിർത്തുകയും ആധുനിക സാങ്കേതികവിദ്യയുടെ സാധ്യതകൾ കൂടി ഉപയോഗിച്ചു സ്കൂളുകളുടെ നിലവാരം കൂടുതൽ മികവുറ്റതാക്കി അന്താരാഷ്ട്ര നിലവാരത്തിലേക്ക് ഈ പൊതു വിദ്യാലയങ്ങളെ എത്തിക്കുകയും ചെയ്യേണ്ടിയിരിക്കുന്നു. ഈ ഉദ്ദേശ്യത്തോടെ ഒട്ടേറെ പ്രവർത്തനങ്ങൾ ഇപ്പോൾ ആരംഭിച്ചുകഴിഞ്ഞിട്ടുണ്ട്. സ്കൂളുകളുടെ ഭൗതീകസൗകര്യങ്ങളോടൊപ്പം അക്കാദമിക നിലവാരവും ഉയർത്തുന്നതിനുള്ള ശ്രമത്തിന്റെ ഭാഗമാണ് **ഒരുക്കം** എന്ന ഈ കൈപുസ്തകം. കുട്ടികൾക്ക് ഈ പഠനസഹായി ഏറെ സഹായകരമാകുമെന്ന് പ്രതീക്ഷിക്കുന്നു. ഈ ഉദ്യമത്തിന് എല്ലാ ഭാവുകങ്ങളും നേരുന്നു.

സി.രവീന്ദ്രനാഥ്

Office : V^th Floor, Room No. 505
Government Secretariat Annexe, Thiruvananthapuram-695 001
Phone-Office : 0471-2327574 Fax : 0471-2332133 Res : 0487-2383229
Mobile : 9447973300 Website : www.ravindranath.org

ആമുഖം

കേരളത്തിലെ സ്കൂളുകൾ മികച്ച വിജയത്തിലേക്ക്

തെരഞ്ഞെടുക്കപ്പെട്ട വിദ്യാലയങ്ങളിൽ 2006ൽ ആരംഭിച്ച **ഗുണമേന്മയുള്ള വിദ്യാഭ്യാസം കുട്ടികളുടെ അവകാശം (QEPR)** പദ്ധതി അതിന്റെ ലക്ഷ്യം നേടി മുന്നേറുകയാണ്. അക്കാദമികവും ഭൗതികവുമായ തലങ്ങളിൽ നിരവധി മുന്നേറ്റങ്ങൾ കൈവരിക്കുവാൻ ഈ പദ്ധതിയിലുൾപ്പെട്ട വിദ്യാലയങ്ങൾക്ക് കഴിഞ്ഞിട്ടുണ്ട്. കേവല വിജയമല്ല മറിച്ച് മുഴുവൻ വിദ്യാർത്ഥികളെയും മികച്ച ഗ്രേഡിന് ഉടമകളാക്കുക എന്ന ലക്ഷ്യമാണ് നമ്മൾ ആഗ്രഹിക്കുന്നത്. ഈ ലക്ഷ്യം മുന്നിൽ കണ്ടുകൊണ്ട് ഒട്ടേറെ പ്രവർത്തനങ്ങൾ ആവിഷ്കരിച്ചു നടപ്പാക്കി വരുകയാണ്.

മികച്ച വിജയം ലക്ഷ്യമാക്കി 2017 ജനുവരി 11 മുതൽ എല്ലാ ക്യൂ.ഇ.പി.ആർ വിദ്യാലയങ്ങളിലും പ്രത്യേക പഠനപാക്കേജുകൾ നടത്തുവാൻ തീരുമാനിച്ചിട്ടുണ്ട്. ഈ പരിപാടിയുടെ കാര്യക്ഷമമായ നടത്തിപ്പിന് വേണ്ടിയാണ് **ഒരുക്കം** എന്ന പഠനസഹായി തയ്യാറാക്കിയിട്ടുള്ളത്. മാറിയ പാഠപുസ്തകം കുട്ടികളിലുണ്ടാകാവുന്ന മാനസിക പിരിമുറുക്കങ്ങളിൽ നിന്ന് കുട്ടികളെ മോചിപ്പിക്കുന്നതിനും അവരിൽ ആത്മവിശ്വാസം ഉണ്ടാക്കുന്നതിനും സർഗ്ഗാത്മകമായ പുനരനുഭവപ്രവർത്തനങ്ങൾ, മൂല്യനിർണയ പ്രവർത്തനങ്ങൾ, അവയുടെ വിശകലനങ്ങൾ എന്നിവ ഉൾക്കൊള്ളുന്ന **ഒരുക്കം** പ്രയോജനപ്പെടും എന്നതിൽ സംശയമില്ല.

വിദ്യാർത്ഥികൾ, രക്ഷിതാക്കൾ, പ്രാദേശിക ഭരണകൂടങ്ങൾ, വിദ്യാഭ്യാസ പ്രവർത്തകർ തുടങ്ങിയവരുടെ കൂട്ടായ പരിശ്രമത്തിലൂടെ ഗുണനിലവാരത്തോടെ മികച്ച വിജയം നേടിയെടുക്കാനുള്ള വർഷമായി 2017 മാറട്ടെ എന്നും ഈ ലക്ഷ്യം നേടാൻ എല്ലാ വിദ്യാലയങ്ങൾക്കും കഴിയട്ടെ എന്നും ആശംസിച്ചുകൊണ്ട്

വിജയാശംസകളോടെ

കെ. വി. മോഹൻ കുമാർ ഐ.എ.എസ്
പൊതു വിദ്യാഭ്യാസ ഡയറക്ടർ

Wave Motion 1

Introduction

You might have got opportunities to engage in experiments and investigative activities and have got ideas about different types of waves and their characteristics. Here are some activities for you to go through. Teachers should make sure that all the learners are now enable to comprehend the expected learning outcomes.

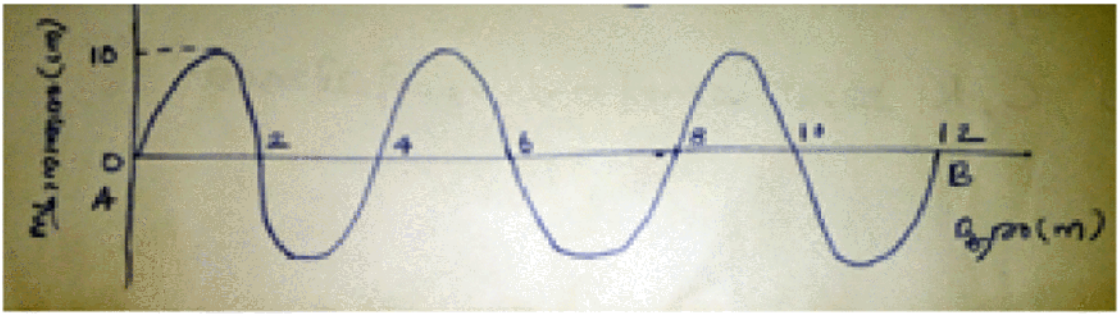
Learning outcomes: The learner can

- Distinguish between different types of waves and classify them as transverse and longitudinal.
- Explain the relation between frequency of a wave, wavelength and speed and can solve related numerical problems.
- Explain forced vibration, resonance and cite examples for equipment that make use of forced vibration.

Ideas : Transverse wave, Longitudinal waves, Speed of sound, forced vibration, resonance.

Activity 1

The graphical representation of a wave formed on the surface of water when a stone is dropped into it is shown below.



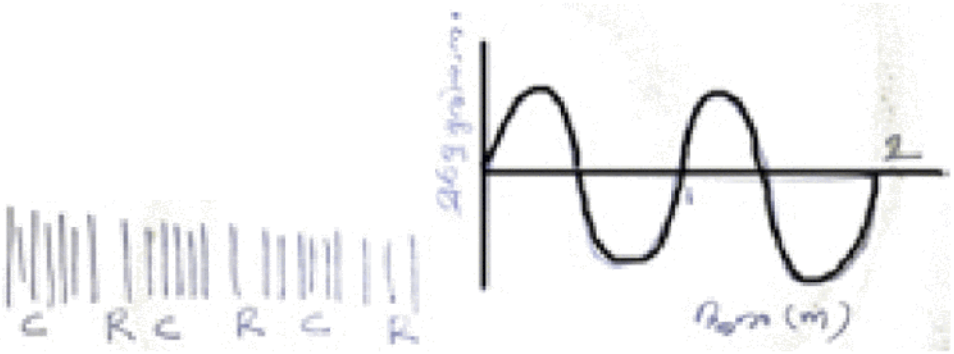
The wave takes is 1 S to reach B from A.

a) What type of wave is this?
b) How the direction of motion of particles is related to the direction of propagation of the wave?
c) Cite more examples for such waves.

d) What is the frequency of the wave?
e) What is the amplitude of the wave?
f) What is the relation between frequency and wave length of a wave?
g) What is the wave length of the above wave?
h) How many crests and troughs are there?

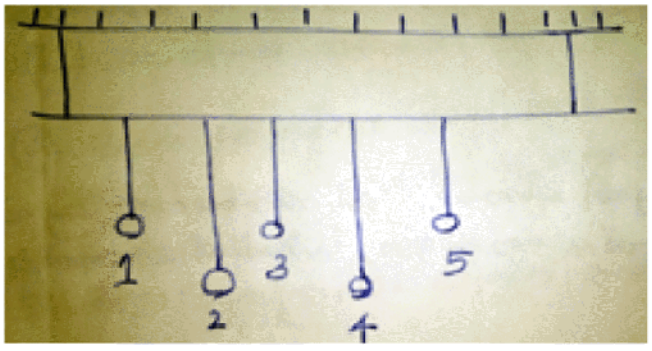
Activity 2

The figure shows the representation of a continuous change in the pressure in air produced due to a sound coming from a source.



a) What do you mean by amplitude and wavelength of a wave?
b) What do C and R represent?
c) If the frequency of this wave is O 2 Hz, calculate its velocity.
d) What type of wave is this?
e) Cite more examples for such wave.

Activity 3



Five hanging bobs are arranged as shown in the figure. The first bob is allowed to oscillate.

a) Which bobs do oscillate with the same amplitude of the first bob?

b) Why do some of the bobs oscillate with same amplitude?
c) If the frequency of oscillation of the first bob is 10Hz, What will be the frequency of oscillation of the second pendulum?
d) Soldiers are not allowed to march across suspension bridges. What may be the reason?

Learning Outcomes

The learner can

- Explain multiple reflection, reverberation, echo and speed of sound, and can solve numerical problems.
- Explain facts related to acoustics of buildings and their importance.
- Know in advance the impacts of destructive seismic waves in nature, take precautions to overcome them and help in rescue work.

Ideas:

Reflection of sound, reverberation, echo, Acoustics of buildings, seismic waves.

Activity 4

While speaking inside a newly built building only a boom of all sounds is heard.

a) What is the reason behind this sensation of hearing?
b) What are the methods to avoid this boom sound felt in a hall?
c) What are the situations that make use of multiple reflection?
d) What is echo?
e) What is the minimum distance to the reflecting surface from a source for hearing echo?
f) Which wave causes earthquake?
g) Prepare a write up about the after effects of earthquake.

Evaluation Activities

Different amount of water is taken in four identical glasses. Each glass is tapped gently using a pencil.

a) Which glasses are possible to produce same sound? (1)
b) Which phenomenon is behind this? Explain (2)

2. A sound signal started from the surface of water, travels 3 km, hits a rock at the bottom of the sea and comes back to the surface. Calculate the total time taken by the sound if the speed of sound in water is 1500m/s. (2)

3. Correct the wrong statements.

a) During monsoon, sound from a longer distance can be heard.

b) The speed of sound decreases with increase in humidity.

c) Sound is transverse wave. (2)

2. Effects of Electric Current

This chapter might have helped you to understand the important effects of electric current, the need of judicious utilisation of electrical energy, the methods to ensure safety while handling electrical appliances, and to achieve awareness and positive attitude for not wasting energy.

Important Ideas.

- ❖ Energy changes in electric appliances – Heating effect – Joule's Law – Heating appliances – safety fuse.
- ❖ Lighting effect of electric current – Different types of lamps (Incandescent lamps, discharge lamp, fluorescent lamp, LED lamp).
- ❖ Electric power – unit of power.

(Some activities from this chapter are provided. The learner can take one hour for working out each activity- Teachers should take care to give opportunities to the learners for making their learning fruitful.)

Activity 1

Complete the table based on the effects of electric current, and energy change.

Electric appliance	Energy change (electrical energy →)	Effect of electric current.
Bulb	.....	Lighting effect
Electric Fan	Mechanical Energy	.....
Electric Iron	.....	Heating effect
Storage battery (While charging)	Chemical Energy	.....

Given below questions are related with heating of an electric iron. Answer them.

- Which is the part that produces heat in an electric iron?
- Which nature of this part is made use in the above situation?
- What is the relation between intensity of electric current and heat energy generated?
- What are the factors that affect the heat generated in such heating appliances?
- What is the relation connecting these factors with the heat generated?
- What is this law known as?

- Name a device that works on this law used for ensuring safety in electric circuits?
- Explain the working of this device.
- Write down two peculiarities of the main part of this device.
- What are other devices that can do the same functions of this device?

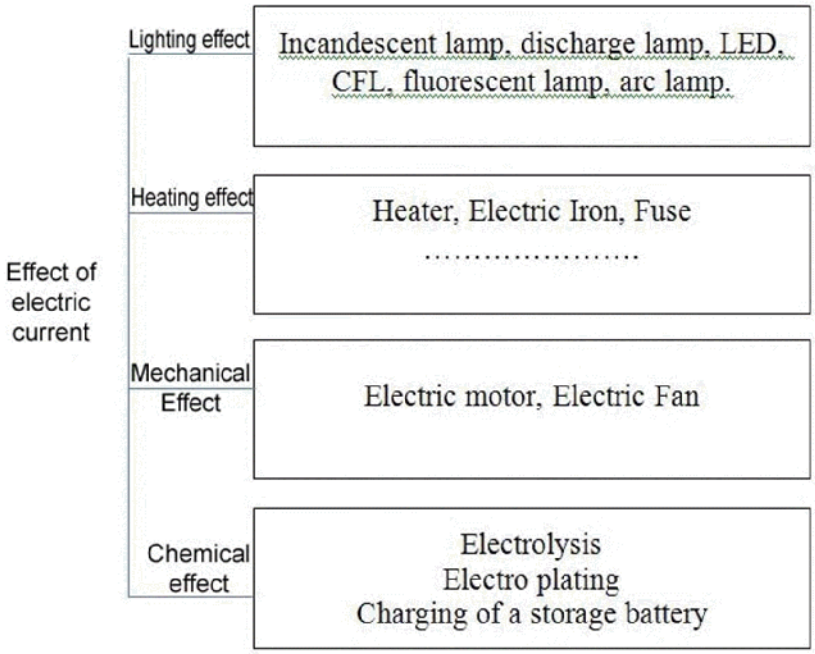
Activity 2

Incandescent lamp, discharge lamp, C.F.L, L E D lamp, arc lamp are given for observation. (Otherwise, make use of their pictures)

Answer the following questions after observing them.

- Identify the names of each lamp.
- Write down the difference in their energy change.
- In which among these lamps, a major part of electricity is lost as heat?
- Arrange them in the ascending order of their energy efficiencies. (The terms 'efficiency', 'ascending order' are to be explained if necessary)
- Which metal is used to make filament of an incandescent lamp? What are the advantages of using this metal as a filament?
- Name the lamps which belong to the group of discharge lamp.
- The colour of the light depends on the gas inside the discharge lamp. Which gases are to be filled for getting white light and yellow light?
- What is the function of electronic circuits in C.F. lamps?
- Name the electronic components used in this electronic circuits. Draw their symbols.
- An incandescent lamp is labelled 100W, 230V, What do you mean by this marking?
- Calculate the energy in J when an incandescent lamp of power 100W works in 10S.
- If this bulb works for 4 hours a day, calculate the amount of energy consumed for 30 days.
- Write down the differences between the terms 'resistance' and ' resistivity'. Mention their units also.
- Which lamps are harmful to environment because of the presence of mercury in it?
- Give an example to the situation where heating effect of filament lamps employed.
- Which lamp is used in rescue work during night time and used in search lights?

To enhance your memory…….



Important part of an electric appliance	The substance with which it is made up of ……
•Heating Coil	Nichrome
•Fuse wire	Tin+lead
•Filament of bulb	Tungston
•Electrode of an arc lamp	carbon

Important Equations

$V = I \times R$ $\qquad$ $p = w/t$

$H = I^2Rt$ $\qquad$ $p = I^2 R$

$P = V \times I$ $\qquad$ $p = v^2 / R$

Energy (in kwh) = $\frac{\text{Power in watt X hour}}{1000}$

Follow up activities

1. Nitrogen gas is filled in incandescent lamps and discharge lamps. What is the purpose of doing so.
2. A current of 5A flows through a resistor of resistance 100 Ω for 10 minute. How much is the heat generated?

3 ELECTROMAGNETIC INDUCTION

Simple activities are given to confirm the ideas which have already been learned. More activities can be done according to the availability of time. Electromagnetic induction, appliances which are working with the principle of electromagnetic induction , working of these appliances etc are discussed in this chapter. It is better to draw pictures in chart paper.

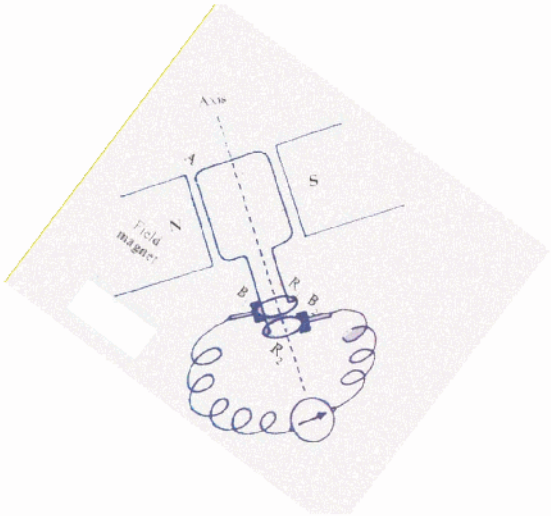
Ideas:- electromagnetic induction, Flemings right hand rule , AC generator, structure of a generator, working,

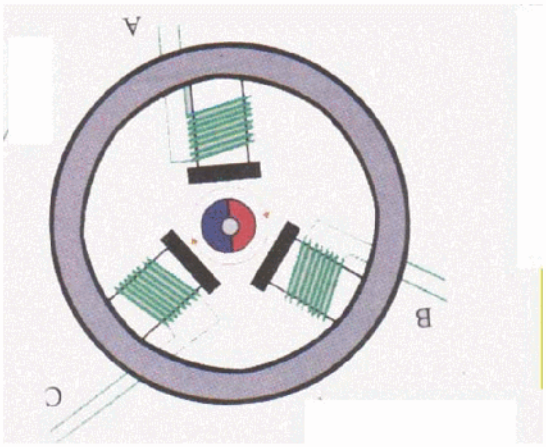
Three phase generator, difference between single phase -- three phase generator and the difference between the graphs.

Activity---1 Observe the figure.

Figure 1

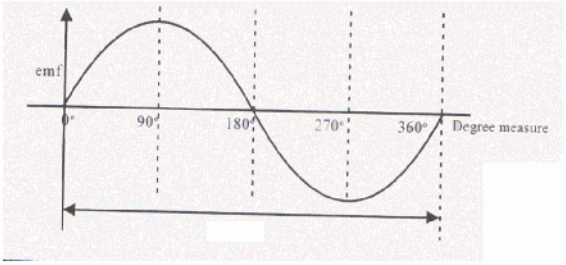
figure 2

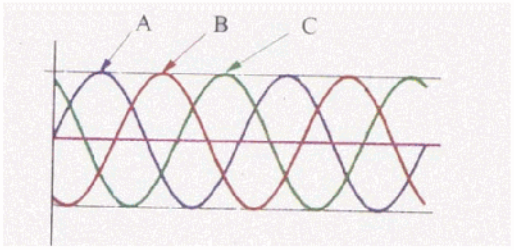




Graph 1

graph 2





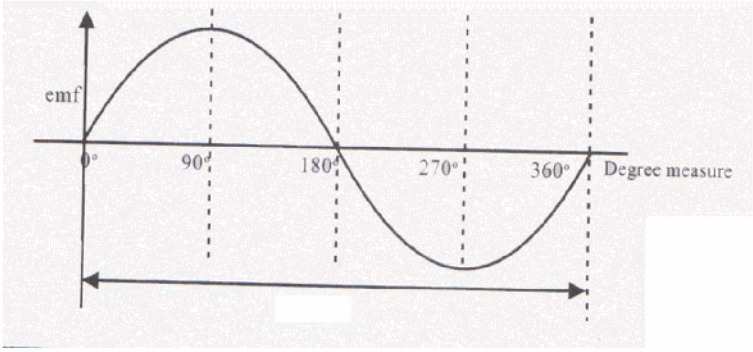
- Identify the device in figure 1?
- What is R_1 and B_1 indicate in the figure?
- What is the working principle of that device?
- Identify the graph which indicate the e m f produced by that device?
- Suggest a way of method to increase the value of emf produced in armature coil of the device?
- Which law is related with the direction of the induced emf in the armature? Explain?
- Power stations are centres that generate and distribute large quantities of electricity

- ❖ Which part is used as rotor ?
- ❖ Which part is used as stator ?
- ❖ What are the advantages of armature used as stator?
- ❖ Field magnets in power generator are electro magnet. Why ?
- ❖ What is the function of exciter in power generator ?
- ❖ Identify the device in figure 2 ?
- ❖ What are the difference in structure of the device 1 and device 2 ?
- ❖ Identify the graph given above of e m f which is produced by that device 2.
- ❖ What is the angle between the armature coils of a three phase generator ?
- ❖ Some statement are given below which related to single phase generator and three phase generator. Classify them.

- For each field magnet, there is only one armature.
- There are three sets of armature coil for each field magnet
- AC generated in all the armature coil will be of the same phase at the same time.
- AC generated in all the three armature coil will be of different phase at the same time.

Ideas:---- AC graph, period, frequency

Activity:-2 Exbit the graph of AC



Observe the graph and answer the following.

- In which angles are the rate of change of flux is maximum ?
- In which angles are the induced e m f will be maximum?
- What is meant by period of AC?
- When armature completed one rotation, how many times will the direction of current change In the circuit ?
- What is meant by frequency of AC ?
- Electricity produced in our country is in 50 H_z . What is the meaning of it ?

(Discuss , related to the rotation of the armature)

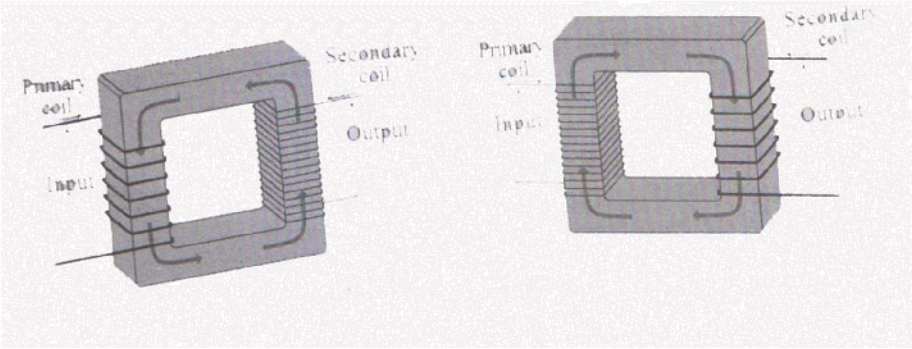
- What is the aim of increasing number of magnetic pole and armature coil in a power generator ?

Ideas :--

Transformer, step- up transformer, step –down transformer and its difference, Relationship between primary –voltage, current, power and number of turns ,secondary –voltage, current, power and number of turns . $\frac{V_s}{V_p} = \frac{N_s}{N_p}$, $V_S I_s = V_p I_p$, problems.

Activity:--Figure

Figure 1 Figure 2



Observe the figure.

- What kind of transformer is in figure 1
- What kind of transformer is in figure 2
- What is the working principle of transformer?
- Some statements are given below which related to step up transformer and step down transformer. Classify them.

- Number of turns in primary is less than secondary
- Thick wires are used in secondary.
- Thick wires are used in primary.
- Intensity of current in secondary is low.
- Voltage in secondary is high.
- Voltage in secondary is low.
- Intensity of current in secondary is high.

- If voltage in secondary is V_s ,voltage in primary is V_p. Number of turns in primary is N_p ,Number of turns in Secondary is N_s ,What is the equation related to this ?
- If primary voltage V_p. Secondary voltage V_s, primary current I_p, and Secondary current I_s, what is the relationship between them?

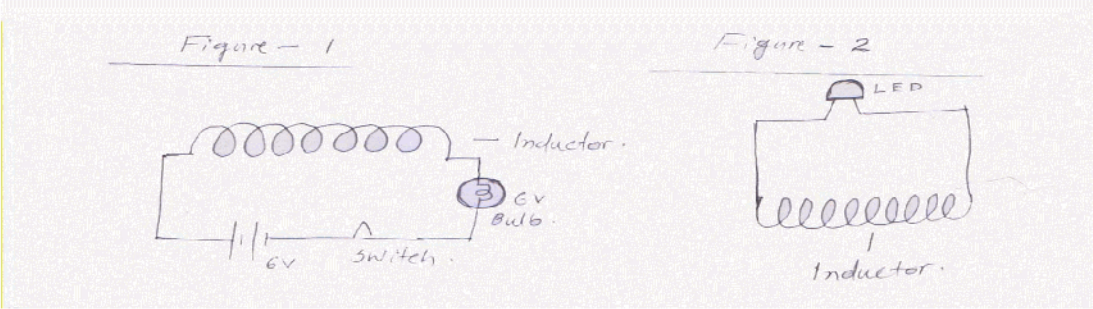
Some relations are given about step -up transformer and step –down transformer. classify them.

$V_p > V_s$, $V_p < V_s$, $I_s < I_p$, $I_s > I_p$, $\frac{N_p}{N_s} < 1$, $\frac{N_p}{N_s} > 1$

Ideas:-- Inductor, Self induction , mutual induction.

Activity :--

Figure 1 figure 2



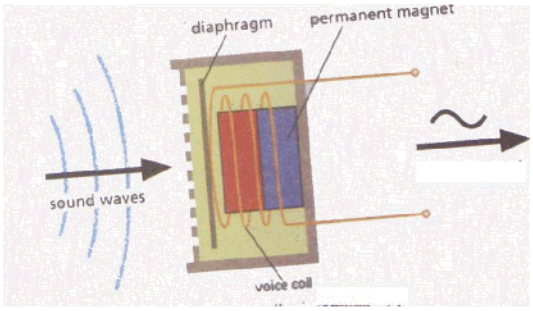
Construct the circuit as in the figure. Observe the intensity of light when switch in the circuit is turn on.

- What change will observe when 6 V battery is connected instead of 6 V AC in the circuit ?
- What change will occur in magnetic flux when 6 V battery is connected to the circuit and 6 V AC connected to the circuit ?
- What is the peculiarity of the induced e m f when AC source is connected in the circuit instead of DC
- What is the name of this induced e m f?
- Name the phenomenon caused to reduce the intensity of light in the circuit .
- What is the change in intensity of light will be occurred when soft iron core is inserted into the inductor ?
- What is the reason for the change in the intensity of light ?
- Inductors are used for controlling intensity of current in AC circuit instead of resistors—what is the reason for it ?
- L E D is glowing when inductor in figure 2 is inserted in to the soft iron core of the first circuit.
- What is the phenomenon which caused to glow the LED ?
- Explain the phenomenon .

Formula in connection with equation of transformer $\frac{V_S}{V_p} = \frac{N_S}{N_p}$, $V_S I_s = V_p I_p$

To do more activities :-

Observe the figure .



Identify the device?

a) What is the energy change takes place in the device ?
b) What is the working principle of this device ?

2) The ratio between number of turns in primary and number of turns in secondary of a transformer is 2:5

a)What kind of transformer is it?

b)What is the ratio between primary current and secondary current in this transformer ?

c) If 80 V is applied to primary of this transformer , what will be the secondary voltage ?

3) If 240 V is applied to primary of a transformer of power 200 W, and we get 12 V from secondary –

a) Calculate primary current and secondary current .

b) Which coil of this transformer is wound using thick wires?

c) What is the reason for this?

4 POWER TRANSMISSION AND DISTRIBUTION

To enable the student to confirm the ideas of the lesson Power transmission and distribution.

Simple activities are given for understanding the ideas. The important ideas are as follows- power stations which works with different energy sources, energy change in that power station, power transmission and transmission loss, star connection, House hold electrification, commercial unit of electric energy, problems.

Ideas:-Various power station, Energy sources, example for different power station.

Activity:-1

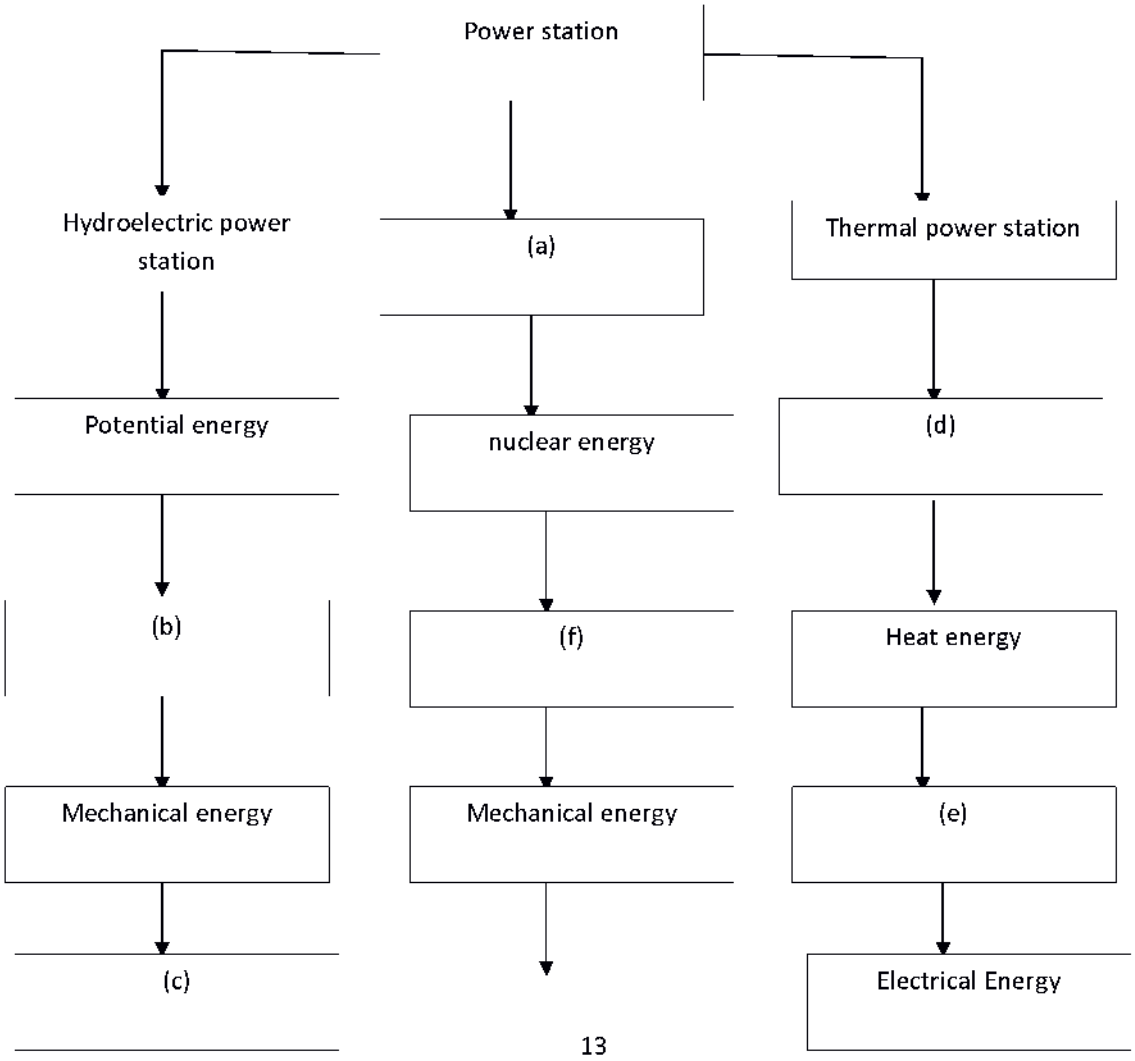
Match the following which related to ideas of different kind of power stations are given below.

- Pallivasal , Coal , Nuclear power station , Flowing water , Thermal power station , Kalpakam , Hydro electric power station , Kayamkulam , Nucrear energy.

Ideas :-- Various power stations, Energy change.

Activity 2:-

There are some terms in connection with various power stations are given. Fill in the blanks suitably.



Ideas:--- power transmission , transmission loss ,high voltage energy transmission ,role of transformer in

power transmission .

Activity:- Power stations are centres that generate and distribute large quantities of electricity. Power transmission is the process of sending electricity to distant places through wires from the power stations.

- What is the voltage at which electricity is generated at the power station ?
- What is the voltage of electricity supplied for domestic consumption ?
- In which stage of power transmission is the step-up transformer used ?
- Which are the stages in which step-down transformers are used in power transmission ?
- What are the problems arises during distant energy transmission ?
- What are the factors which depend when electricity passes through the conductor ?
- What are the methods to reduce the resistance ?

Power is the product of voltage and current. **P= V I**

- What change will occur in power when intensity of current is reduced in the circuit ?
- How is it possible to reduce the intensity of current without power loss ?
- What will be the change in secondary current when secondary voltage of a step-up transformer increased to 10 times ?
- What is the role of step –up and step –down transformer in power transmission ?
- What is the importance of power grid in power generating and distributing systems ?
- The different power generating centres and distributing systems are connected by a network. This network is the power grid.

Ideas :-Distribution transformer , star connection.

Activity :-4

Step-up down transformer in the power distribution system erected for the purpose of household

distribution.

- How many lines reach the input of the distribution transformer ?
- What is the potential of each phase line ?
- How many lines go out of the distribution transformer ? Which are they ?
- Which method is adopted for connecting secondary coil in the distribution transformer ?
- Three phase lines from output of a distribution transformer are connected in to a common point. What is the name of the common point ?
- What is the potential of this common point ?
- What is the potential difference between a phase line and neutral line ?
- What is the potential difference between any two phase line ?
- What is the potential difference between the earth and the neutral line ?

- What is the potential difference between a phase line and the earth line ?
- Draw the diagram of star connection and mark phase to phase voltage and phase to neutral voltage.
- Why birds seated on an electric line do not get electric shock ?
- Distribution of electricity for household purposes is done by using one phase line and neutral line.

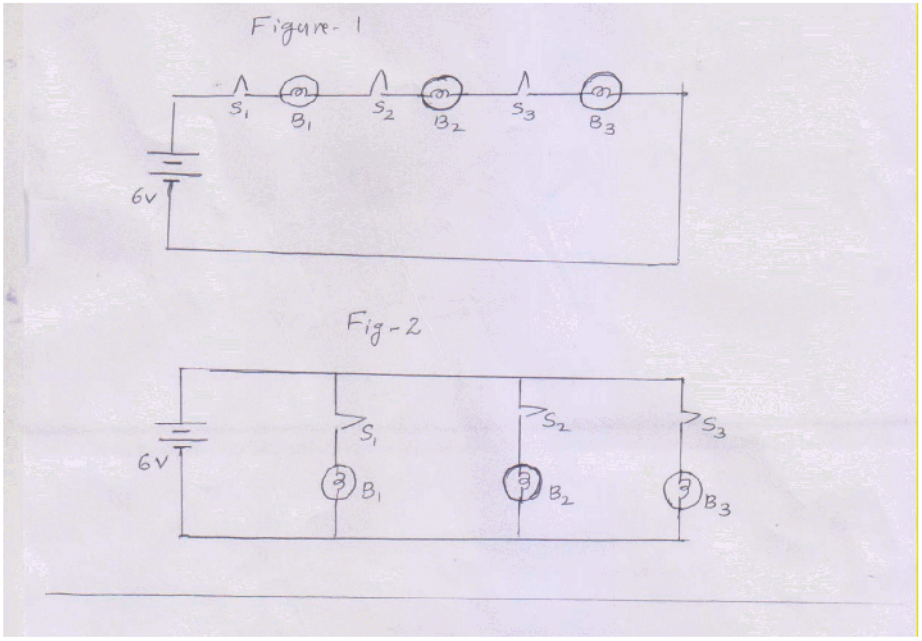
  But the distribution for industrial purpose is done using the three phase lines. What is the

  advantage of this ?

  Ideas :-- House hold electrification, series connection , parallel connection.

  Activity :--

  Using identical bulbs , two circuits are made as shown.



- How are the bulbs arranged in figure 1?
- How are the bulbs arranged in figure 2 ?
- Which circuits has more resistance ?
- All the switches in both the circuits may be turned on, in which circuit do the bulb give brighter light ?
- In which circuit current flowing through each bulb is maximum?

When bulbs are connected in series current flowing through each bulbs are same. When bulbs are Connected in parallel current flowing through each bulb are accordance with their power.

When bulbs are connected in series potential difference across two ends of the bulb is varying With their resistance. When resistance increases potential difference also increases. (V = IR)

When bulbs are Connected in parallel , potential difference across two ends of all the bulbs are same.

- Turn on and turn off the switches in each circuits one after the other, what do you observe ?
- In which circuit can be controlled the device individually ?
- Which mode of connecting devices in your household electrical circuit is advisable ?
- What are the two advantages of this connection ?

Ideas :--Commercial unit of electric energy (k W h) , problem.

The device which used to measure electric energy is watt hour meter.

Commercial unit of electric energy is k W h or unit.

1 k W h = 3600000 J

$$\text{K W h} = \frac{\text{power in watt} \times \text{hours}}{1000}$$

A device of power 1 k W (1000 W) when used for one hour consumes one unit of electric energy

Or 1 k W h.

Activity :- 6

Fill in the blanks in the table.

Appliance	Power W	Number	Duration of use (h)	Energy consumed (k W k)
Bulb	40	5	4	--------(a)----------
L E D	10	4	----------(b)----------	0 .24
Fan	--- (c)	2	5	0 .75

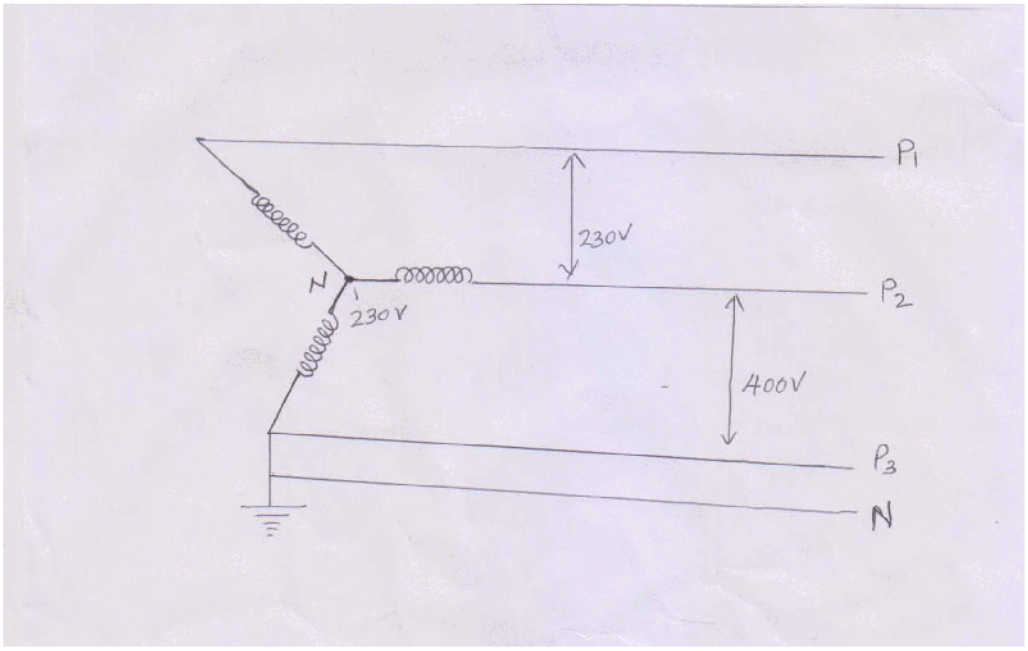
Some more activities :-

1. Three pin plug is used in the circuit of power devices like electric iron.

a) In three pin plug ,what each pin indicate ?
b) Which wires are connected to heating coil of electric iron ?
c) Which part of the device is connected to the earth pin ?
d) How can three pin plug ensure the safety of the device ?

2) What is the reason for massaging the body of a person who get electric shock ?

3) A picture which is drawn by a boy is given. If anything wrong, redraw the picture with full details.



4) In a house, 5 CFL lamps each of 18 W works for 6 hours.

a) Calculate the cost of electric energy consume for one month at the rate of 4 Rupees per unit.

B) How much can save if 7 W LED bulbs are used instead of 18 W CFL ?

UNIT 5

HEAT

Heat, as a form of energy play, vital role in our daily life. The heat contained in a body, temperature, change of state, vaporization, evaporation, global warming etc, are related with this energy.

Activity-1

Observe the boiling tea and note the movements of dusts. The speed of particles increases as we supply more heat. Select the right option.

- Particles in an object is in ---------- rest/motion
- The energy possessed by moving object is ----------
  Kinetic energy / Potential energy.
- The total kinetic energy of particles in a body is ----------
  Light energy / Heat energy
- The device used to measure the increase in temperature is -----
  Voltameter / Thermometer

- Why heat energy flow from one place to another ?
  - Difference in temperature

Works sheet

1.

Connect the information in A, B in right way	
A	B
Heat	4.2 joule
Temperature	Joule.
1 calorie	Kelvin

2. Identify the relation and fill the blank

   a. Heat : Jaule
      Temperature : -------
   b. Electric currant : Ammeter
      Temperature : ----------

Activity – 2

By observing a Celsius thermometer and a Fahrenheit thermometer note down the atmospheric temperature.

- Why did you observe difference ?
- For what purpose we use Celsius scale?
- Which scale is used to measure our body temperature in clinics.
- Write down the formula, showing the relation between Celsius scale and Fahrenheit scale.
- Find out Fahrenheit equivalent for 50^0c.
- Which is the S1 unit of temperature ?
- What is the melting point of ice in Kelvin scale ?
- The lowest temperature possible, is known as ……..
- The lowest possible temperature in Celsius scale is ---------- (0^0C, 273^0C)
- In absolute zero, how much is the kinetic energy of particles ?

WORK SHEET

1. Observe the diagram (Text book. Page No.77 fig 5.1)
2. What is the lowest possible temperature in Fahrenheit scale
3. What is the Fahrenheit equivalent of 373K
4. In which unit , the melting point of ice marked as 32^0
5. Identify the units, in which the change in temperature is equal.

Acitivity-3

Heat required to increase the temperature of 10kg of water by 1k is 42000. Then how much heat will be required to increase the temperature by 1k for 1 kg of water ?

$$\frac{42000}{10} = 4200 \text{ J}$$

Heat required to raise the temperature of a body by 1K is it's heat capacity. Then what will you call the temperature required to raise the temperature of 1 kg. of a substance by 1K?

1. What is the unit of heat capacity ?
2. What is the unit of specific heat capacity ?
3. The Specific heat capacity of water is very high. Site an instance, where this quality is utilized ?
4. Why does the land heat 5 times faster than water ?
5. Name the natural phenomenon happens due to this difference?

Activity – 4

Can you boil a bucket full of water, by giving the same amount of heat required to boil a small cup of water?

- Identify, that object can absorb more heat as the mass (m) increases

Is the heat required to rise the temperature by 10^0C and heat required to boil a cup of water same ?

- Identify that more heat is absorbed as the temperature difference increases.

When same quantity of oil and water are heated, oil heats up faster than water

- Identify that heat absorbing capacity is different for different materials.

- ♦ What are the factors that influence the heat absorbed by a body ?
- ♦ Write the equation to calculate quantity of heat absorbed.
- ♦ The specific heat capacity of copper is 385 J/kgk
  a) What do you mean by this ?
  b) Calculate the heat required to raise the temperature of 5kg of Copper from 30^0C to 35^0C

WORKSHEET

Q. 1. Water at 343k is mixed with milk at 293k.

a) The effective temperature will be.... ?
(293k, 343k, in between 293k and 343k)

b) Which liquid has heat loss?

c) Which liquid has heat gain ?

d) Here the heat gain and heat loss are same. Name this principle.

Change of State

Activity – 5

Note down the temperature, during melting of ice.

- Is there any change ?
- Which energy of molecules is related temperature?
- If so, is there any change in kinetic energy of molecules ?

During melting of ice, the molecules spread apart and for this potential energy is needed

Here, in which form of energy, the heat supplied is being absorbed ?

Heat absorbed during charge of state is used to increase the potential energy of molecules. As there is no change in kinetic energy the temperature remain constant.

WORKSHEET

Q. 1. Find out the correct statement related to the melting of ice.

a) The kinetic energy of molecules increases.

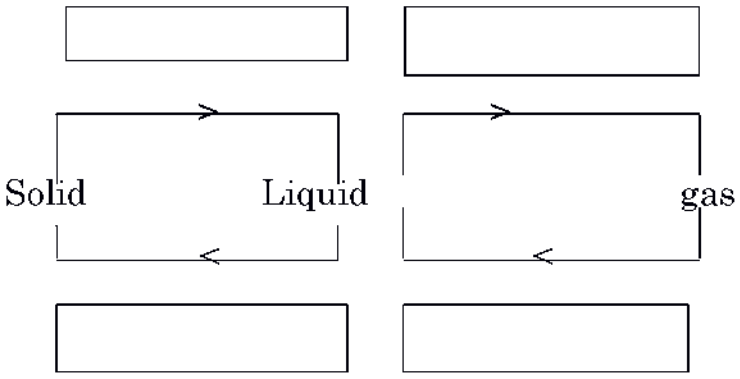
b) The kinetic energy of molecules decreases

c) The potential energy of molecules increases

d) The potential energy of molecules decreases

Q.2. What will you call the heat absorbed by a solid substances during its change of state.

Q.3. Fill in the blank



The melting point of a solid and the freezing point of it's liquid state will be same.

Q.4. What is the freezing point of water in Kelvin Scale ?

Q.5. 1kg ice absorbed 335000J heat to melt completely. Then, what will be the heat released by the same water to freez ?

Activity – 6

- Don't you see boiling water ….. ?
- To which state water changes to?
- Which energy form of molecules changes ?
- For what purpose does the heat supplied is utilized ?
- What do you mean by latent heat of vaporization ?
- How much is the latent heat of vaporization of water?

The latent heat of vaporization of water is high in companion with other liquids

1. Cooking in steam is easier. Why?
2. What will you call the process by which a liquid changes into vapour at any temperature?
3. From where does the heat is absorbed during evaporation?

4. Why does evaporation cause cooling ?
5. Find out examples from daily life where evaporation causes cooling
6. Compare the process vaporization and evaporation
7. List the factors that influence evaporation.

WORK SHEET

Q.1. Classify the following statements and give suitable titles

a) Happens at any temperature

b) Happens only at the boiling point

c) Happens only at the surface of liquid.

d) External Heat is required.

Q.2. Say reason.

a) Wet clothes dry easily if it keep spread.

b) Usually we keep a wet cloth over the forehead of person having fever.

Activity- 7

Observe a video related to global warming.

a) What are the green house gases ?

b) What do you mean by global warming

c) What are the hazards due to global warming?

Conduct a seminar on global warming as group activity.

----------x----------

6 Colours of Light

This unit might have given you opportunities to understand some phenomena about light and might have brought you to the wonderful world of colours. You are provided with some activities that may help you to enhance your memory. Teachers should provide more activities so that the learners can achieve all the expected learning outcomes.

Learning Outcomes

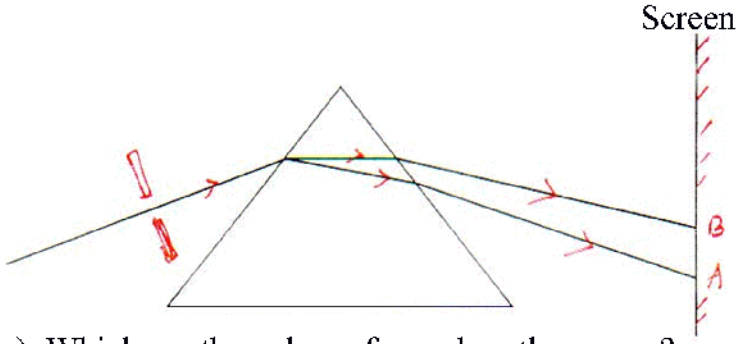
The learner can

- Explain that composite light is subject to dispersion and that the deviation of each component colours depends on the wave length.
- Explain the formation of rainbow and its peculiarities.
- Explain how composite light is obtained with the help of experiments.
- Explain persistence of vision with the help of examples.

Ideas : Dispersion, spectrum, persistence of vision, Newton's colour disc.

Activity 1

Observe the figure



a) Which are the colours formed on the screen?
b) Explain the phenomenon that causes the formation of array of colours.
c) Which are the colours denoted by 'A' and 'B' ?
d) Which colour deviates the most?
e) Which colour deviates least?
f) Different colours undergo different deviation. Why?

Activity 2

Newton's colour disc is made by painting the constituent colours of white light in the same order and proportion.

a) In which colour does the disc appear when rotated fast?
b) The reason behind such an appearance is a phenomenon related to our eyes. What is it explain.
c) If the disc is rotated slowly, what will be the observation?
d) Why does a torch rotated appear as an illuminated circle.
e) Find out more such experiences from your daily life.

Learning Outcomes.

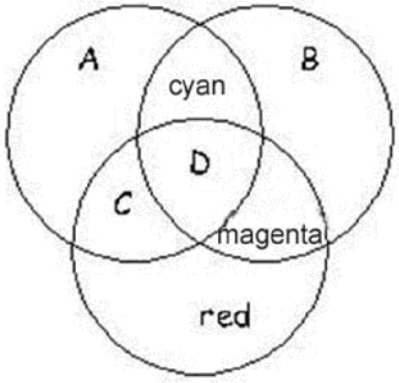
The learner can

- Include in experiments for identifying primary and secondary colours and explain the results of combination of colours.
- Explain the reason for original colours of transparent and opaque objects and the difference of colours of objects in artificial light.

Ideas: Primary colour, secondary colour, complementary colour, original colour of opaque objects, Original colour of transparent objects.

Activity 3

Observe the figure:



a. What are the colours of the region A, B, C & D?
b. Which are primary colours?
c. Which are secondary colours?
d. What do you mean by complementary colours?
e. What is the complementary colour of green?
f. What are colour filters?
g. What is the colour of a red flower when viewed through yellow filter?
h. What is the colour of an object that reflects all colours?

Learning Outcomes

The learner can

- Explain the features of solar spectrum.
- Explain practical aspects of scattering.

Ideas : Solar spectrum, scattering of spectrum, tyndal effect, infrared photography.

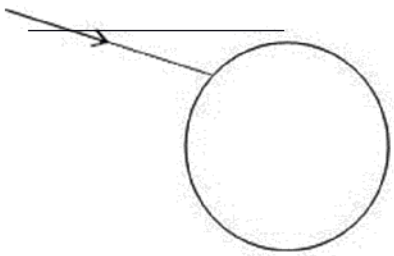
Activity 4

Apart from visible light, there are other radiations in solar spectrum. All these radiations in the sun light are also a part of the wide spectrum known as electromagnetic spectrum.

a) Which are the waves that are present in the electromagnetic spectrum?
b) Which radiation has highest wavelength?
c) Which radiation has highest frequency?
d) Which radiation makes sunlight hot?
e) What are health hazards created by ultraviolet radiation?
f) Which colour among visible light scatter more?
g) Why does the rising and setting sun appear orange red?
h) The sky is dark in the moon. What is the reason?
i) In ta misty morning, the path of rays of light can be seen clearly. Which phenomenon makes it possible? Explain.
j) Infrared radiations are used to take photography of distant objects. Why?

Evaluation Activities

1. The figure shows a ray of sunlight falls obliquely on a water drop.



a) Complete the figure (2)
b) How many times does the ray of light undergo refraction? (1)
c) A natural phenomenon is there that connected with this figure. Name it? (1)

2. Match columns A, B and C suitably. (3)

Colour of light	Complementary colour	Colour obtained
Green	(a)……	White light
……	Blue	(b)……
Red	(c)……	White light

3. The telescope 'Chandra' is placed in the space. What is the advantage of placing it there? (2)
4. If a plant with green leaves and red flowers is kept in a dark room. What will be the observed colours of leaves and flowers in red light? Illustrate. (2)

7 Electronics and Modern Technology

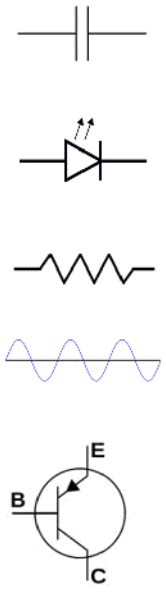
Science and Technology are in their path of growth. Twentieth century was considered the electronic age. Technological achievements have highly influence social life. Through this chapter, you might have gone through the wonderful achievements brought by Electronics, the branch of Science. While understanding all these developments, we should also develop an echo friendly perspective in the Management of E-wastes.

Important Ideas

Modern Science and Technology – Electronics – electronic components – symbols – diodes – Rectification – Transistors – I C chips – Fields of Modern Science and Technology – Telecommunications – Digital Camera, Nanotechnology – Robotics – Waste Management .

Activity 1

1. Match the symbols with those given in bracket. (Resistor, Capacitor, LED, diode, transistor)

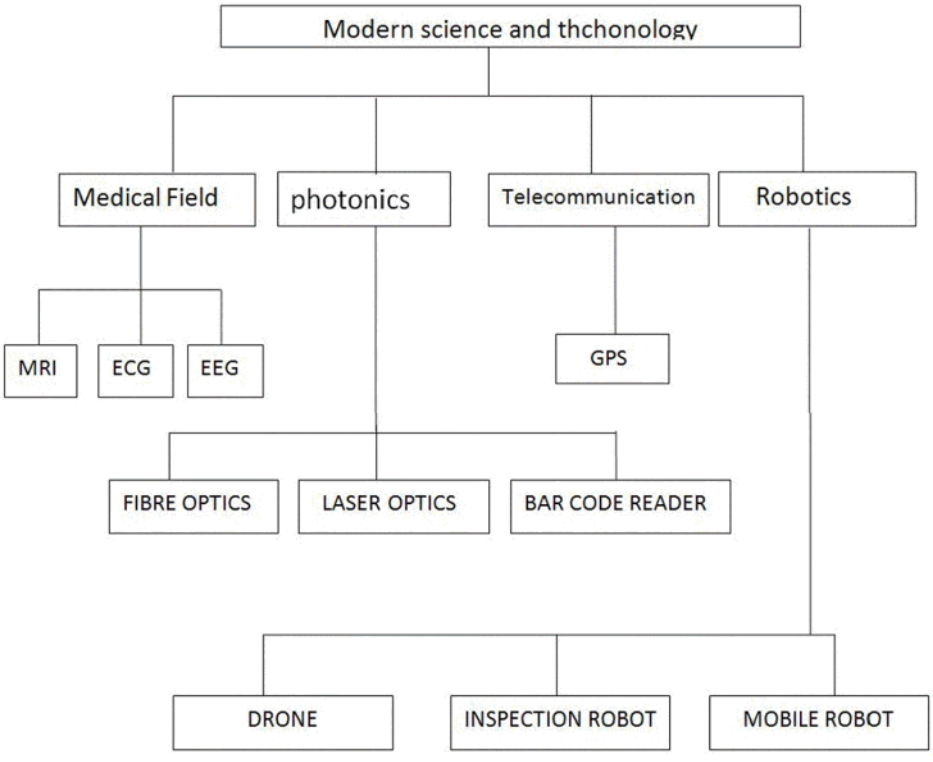
Symbol	Device
	

- What is the function of a resistor in a circuit?
- How does an inductor work in ac circuit?

- What is the use of a capacitor?
- Write about different types of capacitors.
- How can the conductivity of semiconductors increased? How many types of semi conductors we can make in this way?
- How are diodes formed?
- How does a diode work in a circuit?
  (forward biasing, reverse biasing)
- How is an LED differ from a diode?
- What are the advantages of LED ?
- What is meant by rectification ?
- How is it possible in a circuit?
- How many types of rectifications are there? Which are they?
- What is the function of a transistor in an electronic circuit?
  A damaged amplifier was given for repairing, the suggestion from a service centre was that the damaged IC should be replaced.
- What do you mean by IC ?
- Which electronic component cannot be incorporated in an IC Chip?
- What are the advantages of IC chips?

Activity 2

Answer the following questions based on the pictorial representation.



- What do you mean by photonics?
- Which are the branches of Science related to this?
- Write down some situations where we use laser optics.
- Which is the modern device used for sending more data to distant places much faster without energy loss.
- Which device is used to convert pictures and scenes into digital signals?
- Write two devices that make use of small digital cameras.
- Write down the full form of HD in HD transmission.
- Give an example for the modern HD system.
- Which is the branch of Science that makes new substances and parts of devices using particles of very small size?
- Name the machine designed to perform those tasks which are both possible and impossible for human beings.
- Name is the branch of Science which deals with their construction and uses.
- Which System is used to control the flight of remote controlled robots.
- Give two examples for electronic devices used for diagnosis of diseases.

To enhance your memory……

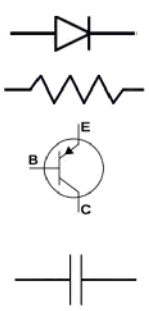
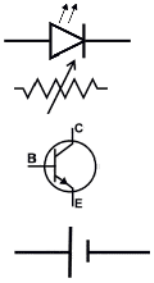
Parameters	units
Resistance	- ohm – Ω
Inductance	- henry – H
Capacitance	- farad – F

First electronic computer – ENIAC
Electronic Numerical Investigator and Calculator

Electronic function	Device
Rectification	Diode
Amplification	transistor

Follow up activities

1. Complete the table

Symbol	Name of component	Symbol	Name of component
			

2. What are the main characteristics of LED?
3. Explain WiFi (Wireless fidelity) in modern technology.
4. What do you understand from E – waste?
   Write down the ways to minimise E – wastes.

8 SOURCES OF ENERGY

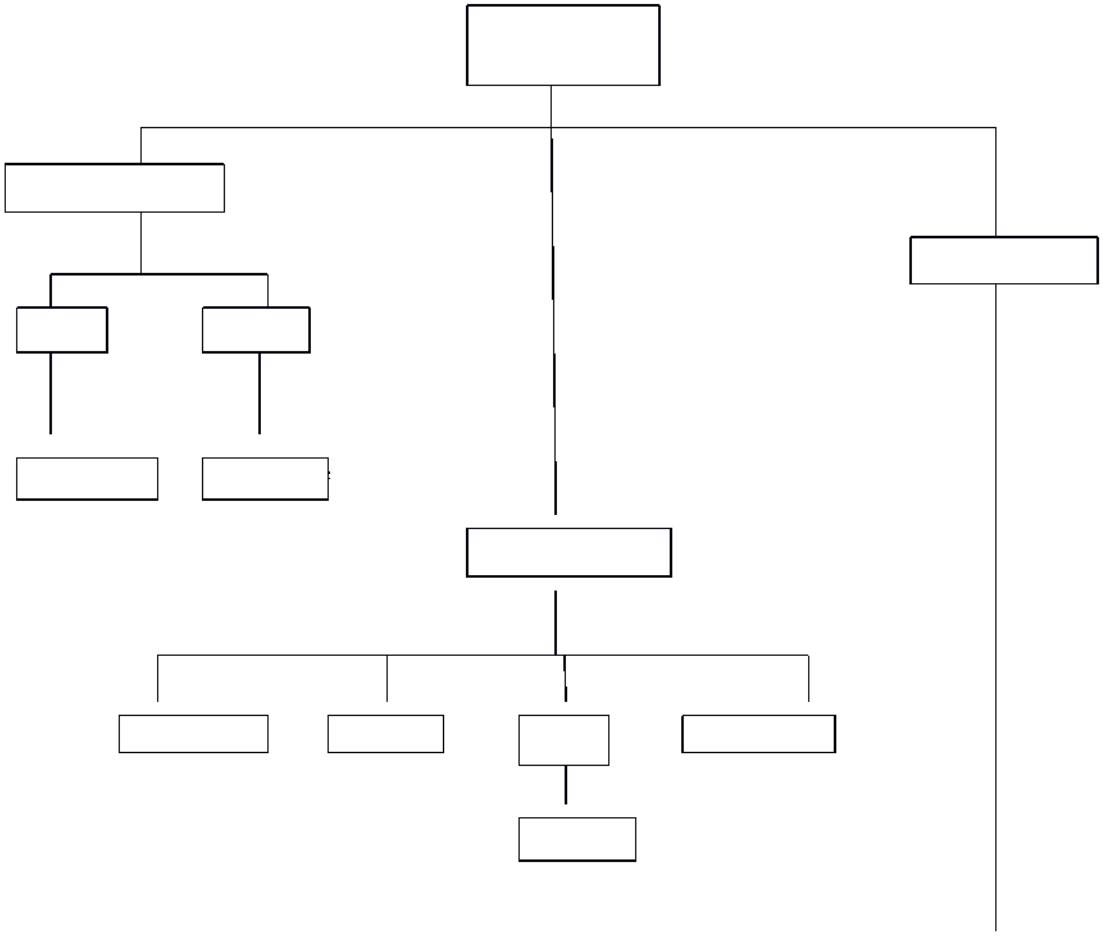
Production of energy is not happening in accordance with the high need of present situation. To overcome this we have to find out new energy sources that are environment friendly. Solar energy must be utilized in a better way. This chapter deals with energy sources and gives directions to control the use of fossil fuels.

Important facts / Activities

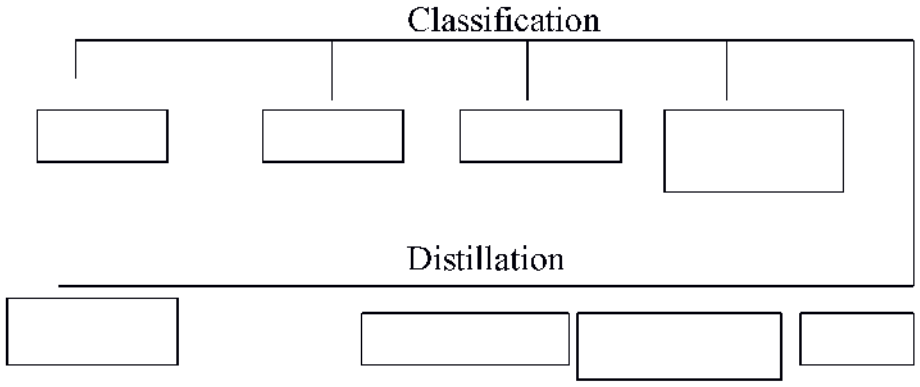
- Complete combustion, partial combustion
- Fossil fuels and their uses
- Non-conventional energy sources
- Green energy, brown energy
- Nuclear energy

What is the importance of making pollution testing of vehicles mandatory ?

Activity



Butane



Important concepts and activities

- To convince the students about the importance of complete combustion
- To know about the fossil fuels, and why is the consumption of them to be controlled.
- To know about the non-conventional energy sources like hydrogen, biomass, biogas, solar energy and nuclear energy.

Activity -1

Observe the fast and complete combustion of a flat paper. Understand that combustion of a crumbled paper make more smoke.

- List the conditions for the complete combustion
- Name the gases produced during complete combustion
- Name the gases produced during partial combustion.
- How does the partial combustion causes the environmental pollution? (Besides the fuel loss and time loss, the carbon monoxide produced during partial combustion
- How are the fossil fuels formed ?
- Why are they considered as non-renewable?
- Write the full form of LNG and CNG
- Which is the main content of LNG ? What are the uses of CNG?

Name the main content of CNG.

Due to high fuel efficiency and less pollution, LNG is used is a fuel in vehicles.

The importance of LNG is the convenience for distribution

1. Write the full form of LPG, what is its main content?
2. Why is ethyl mercaptain added to LPG/
3. Which element is the main content of coal ?
4. Name the different types of coal ?
5. Name the process by which the components of coal are separated
6. Write the products obtained by the distillation of coal.

WORK SHEET

1. Identify the relation and fill in the blanks
   a. LPG - Butane

      LNG- ----------

   b. LNG – Fuel in Vehicles

      LPG - ----------
2. Name the chemical used to identify the leakage of cooking gas.
3. Find the odd one out and explain the reason (Peat, Anthracite, Bauxite, Lignite)

Activity – 3

Is the heat produced by the combustions of different fuels the same Discussion.

- What do you mean by fuel efficiency?
- Which physical quantity is used to refer fuel efficiency?
- What is its unit ?

- The calorific value of CNG is 50000KJ/Kg. What do you mean by this ?
- Even having high calorific value hydrogen is not used as domestic fuel, Why?
    - Highly Explosive
    - Difficult to store
- List the qualities of a good fuel
- Compare biomass and biogas
- Name the device that converts solar energy in to electrical energy.
- What is the reason for electric current in this device ?

In a Solar Panel Solar energy is converted in to electrical energy

- What do you mean by a Solar panel
- Write down the situation where solar panels are used
- What is the energy change is solar heaters?
- What is the difference between a solar voltaic power plant and solar thermal power plant?

ACTIVITY -4

Watch the animation video of nuclear fission and fusion

- Explain how energy is released during nuclear fission?
    - Mass defect
    - $E=mc^2$
- Which nuclear reaction happens in an atom bomb ?
- $E=mc^2$

  E= energy, then m= ---------, c = ----------
- What will you call the nuclear reaction in which small atoms combines?
- Which nuclear reaction is carried out in stars?
- What is energy change in a nuclear reactor ?

- Classified the given energy sources into conventional and non-conventional energy

(Fossil fuels, Solar energy, Nuclear energy, Biomass, Hydro Electric Power)

- What will call the energy sources that lead to global warming?
- What do you mean by green energy ?
- Why is it instructed to control the use of brown energy sources?
- List the names of renewable energy sources.
- Write down the causes an remedies of energy crises.
- By using pressure cooker we can conserve energy. Explain how?

Worksheet

1. Classify the given energy sources into renewable and non renewable (Solar energy, Petroleum, Nuclear energy, Coal, Geothermal energy)
2. Identify the relation and fill in the blanks
   a) Hydrogen bomb : Nuclear fusion
      Attom bomb : ----------
   b) Solar energy : Green energy
      Nuclear energy :----------
3. Why green energy is called clean energy ?
4. What is the fuel used in a nuclear reactor?